ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Aurubis Bulgaria AD
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AUR-20260167-CBA1-EN
Issue date	21/04/2026
Valid to	20/04/2031

Iron Silicate Fines

Aurubis Bulgaria AD

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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General Information

Aurubis Bulgaria AD

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-AUR-20260167-CBA1-EN

This declaration is based on the product category rules:

Lightweight aggregates / Bulk granulate, 01/08/2021
(PCR checked and approved by the SVR)

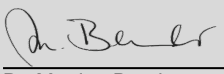
Issue date

21/04/2026

Valid to

20/04/2031

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

Iron Silicate Fines

Owner of the declaration

Aurubis Bulgaria AD
Industrial zone 1
2070 Pirdop
Bulgaria

Declared product / declared unit

1 ton iron silicate fines

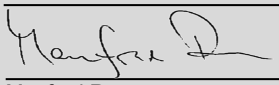
Scope:

Iron-silicate fines aggregates up to a grain size of 2 mm from the production at the Aurubis site, Pirdop, Bulgaria.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Manfred Russ,
(Independent verifier)

Product

Product description/Product definition

Iron silicate fines is a construction product manufactured by Aurubis Bulgaria, with universal application in many areas of the construction process, starting from the structural elements, through brick walls till finishing works like plasters and coatings for buildings and facilities.

Iron silicate is co-produced during pyrometallurgical smelting and refining of copper from primary raw materials at high temperature in molten state in a furnace and further treatment by a flotation process. The iron silicate is further filtered.

It mainly contains iron silicate, silicates of aluminum and calcium and magnetite. Traces of other non-ferrous metals are reduced to the lowest extent economically and technologically viable, and are largely included in the silicate phases. Its physical and chemical characteristics remain consistent over time.

Iron silicate fines is compatible with a wide range of materials such as limestone, clay, clinker, soils, cement, sand, coarse aggregate, bitumen, polymers, epoxies, and other construction chemical products. Incorporating it in varying proportions allows for the modification of specific properties of the final products and giving them better performance.
For the placing of the product on the market in the European Union/European Free Trade Association /EU/EFTA) (with the exception of Switzerland) the *Regulation (EU) No. 305/2011 (CPR)* applies. The product has a declaration of performance taking into consideration:

- *BNS EN 12620:2002+A1:2008, Aggregates for concrete*, and
- *BDS EN 13139:2004, Aggregates for mortar*.

Based on *Regulation (EU) No. 305/2011 (CPR)* and delegated regulation (EU) 2024/2769 this product has ETA 23/0286 from 02-06-2023 Cement with industrially produced filler 42,5 with iron silicate fines following by CE-marking.

For the application and use the respective national provisions and regulations apply.

Iron silicate fines are widely used as an iron-correcting additive in clinker manufacturing, a key stage in cement production. While standards define composition and conformity requirements for the finished cement product, no equivalent framework exist for the raw materials used in clinker production. The same situation applies to ceramic brick manufacturing: numerous standards specify performance and quality criteria for final ceramic products, yet they do not set composition-related requirements for the input raw materials.

Application

The designated applications of iron silicate fines covered in the EPD are:
- Production of cement clinker;
- Production of clay masonry units;
- Production of concrete;
- Production of mortars;
- Production of blended cement.

Technical Data

The technical specification and parameters declared within the CE mark of iron silicate fines in the declarations of performance related to BNS *EN 12620:2002+A1:2008, Aggregates for concrete* and BDS *EN 13139:2004, Aggregates for mortar* are given in the table below

Parameters declared within the ETA 23/0286 from 02-06-2023 Cement with industrially produced filler 42,5 with up to 20% iron silicate fines in cement are given in the table below.

Constructional data

Name	Value	Unit
Bulk density BNS EN 1097-3:2000	1800	kg/m3
Specific density BNS EN 1097-7:2022	3700	kg/m3
Loss of ignition BDS EN 196-2: 2013	0.01	%
Angle of friction BDS EN 1997-1:2005	70	%
Density of the grains BDS EN 12620:2002+A1:2008/ EN 13139:2004	3,6 ÷ 3,9	Mg/m3
Water absorption BDS EN 12620:2002+A1:2008/ EN 13139:2004	≤ 0,1	%
Chlorides BDS EN 12620:2002+A1:2008/ EN 13139:2004	≤ 0,01	%
Acid soluble sulfates BDS EN 12620:2002+A1:2008/ EN 13139:2004	0.1	%
Total sulfur content BDS EN 12620:2002+A1:2008/ EN 13139:2004	<1	%
Content of organic impurities – humous content BDS EN 12620:2002+A1:2008/ EN 13139:2004	not detected	%
Content of soluble SiO2 BDS EN 12620:2002+A1:2008/ EN 13139:2004	<50	mmol/dm3
Index of specific activity BDS EN 12620:2002+A1:2008/ EN 13139:2004	<1	
Cement composition ETA 23/0286	Clinker: 80-94 ISF: 6-20	%
Compressive strength, 28th day ETA 23/0286	≥43,0	N/mm2
Compressive strength, 2nd day ETA 23/0286	≥18,5	N/mm2
Initial setting time ETA 23/0286	195	min
Soundness ETA 23/0286	2,3	mm
Sulphate content ETA 23/0286	2,72	%
Chloride content ETA 23/0286	0,07	%
Pozzolanic activity ETA 23/0286	passed	
Density ETA 23/0286	3,32	g/cm3
Fineness (Blaine) ETA 23/0286	3074	cm2/g
Content of released dangerous substances ETA 23/0286	none	%

Performance data of iron silicate fines respect the chemical characteristics in accordance with relevant technical specifications (no CE-marking) and suitability for use as a raw material in cement clinker and ceramic production.

Base materials/Ancillary materials

Name	Value	Unit
Iron silicate, copper smelting and -refining, associated EC number: 701-480-0	100	%

The product contains substances from the ECHA Candidate List of Substances of Very High Concern for authorization (Date 05.11.2025) above 0.1 mass %: No

Reference service life

The service life of iron silicate depends on the intended use. As an aggregate in concrete and cement production, a reference service life of ≥ 50 years can be expected according *BBSR*

tables - Service Life of Building Components.

LCA: Calculation rules

Declared Unit
The declared unit is 1 ton of iron silicate fines. A conversion into m³ can be made using the specified specific or bulk density.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	t
Bulk density	1800	kg/m3
Specific density	3700	kg/m3

The value given as bulk density is an average value that may be subject to slight fluctuations depending on the grain size. The LCA results are based on an average value of iron silicate fines of different grain sizes. The mean value was calculated for all grain sizes produced by the manufacturer. The results are therefore subject to a certain degree of variability, as production data may differ slightly depending on the grain size produced.

System boundary
Type of EPD: cradle to gate + modules C1-C4 and module D (A1-A3, C, D).

Module A1 to A3:
The production stage A1-A3 includes the processing of iron silicate fines, a by-product of copper production at Aurubis. Burdens for the provision of raw materials are allocated 100% to copper production.
These modules consider the demands for auxiliaries and energy for operating the production sites. The processed iron silicate fines is sold as bulk material without packaging.

Module C1 to C4:
Whether and in what form dismantling takes place depends on the application of the iron silicate fines. For Module C1, dismantling with a diesel-powered excavator is assumed. Module C2 takes into account truck transport (diesel, Euro 6) over 50 km to a waste treatment site.
Two scenarios are declared for waste treatment:

1. 100 % recovery (C3; C4): Representative burdens for construction waste processing; crushing of the iron silicate fines and its use as bulk granulate or gravel (recovery includes 3% losses in waste processing).
2. 100 % landfill (C3/1; C4/1): Landfilling of the iron silicate fines.

Module D:
As the unprocessed iron silicate fines enters the system burden-free as a by-product of copper production, no recycling potentials are associated with Module D. This approach follows the specifications from the *PCR Part A, chapter 6.5.6*.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Bulgaria

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. All background data was taken from the *Sphera MLC databases*, version CUP 2025.1. The LCIA-results were calculated using the LCA software *LCA FE from Sphera*.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon
The product contains no biogenic carbon. As the product is delivered without packaging, no biogenic carbon is to be declared for packaging.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

Information on the electricity mix used in module A3:
Global Warming Potential (GWP-total acc. EN15804, EF3.1) of electricity mix: 0.45 kg CO2 eq/kWh

End of life (C1 - C4)
Two scenarios are declared for waste treatment:

1. 100% recovery (C3; C4): Representative burdens for construction waste processing; 3% losses are included in the used LCI-dataset.
2. 100 % landfill (C3/1; C4/1): Landfilling of the iron silicate fines.

Name	Value	Unit
Collected separately waste type construction waste	1000	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling (C3)	1000	kg
Recovered material from recycling (C3; D)	970	kg
Energy recovery	-	kg
Landfilling (C4/1)	1000	kg

LCA: Results

The following information on the environmental impacts was determined using the characterization factors according to EF 3.1, which correspond to EN 15804+A2.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 ton Iron Silicate

Parameter	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO_2 eq	4.6E+00	6.5E-01	4.16E+00	2.77E+00	0	0	1.53E+01	0	0
GWP-fossil	kg CO_2 eq	4.59E+00	6.41E-01	4.11E+00	2.74E+00	0	0	1.53E+01	0	0
GWP-biogenic	kg CO_2 eq	3.91E-03	2.04E-03	7.71E-03	1.38E-03	0	0	0	0	0
GWP-luluc	kg CO_2 eq	1.21E-03	6.65E-03	4.34E-02	2.36E-02	0	0	6.27E-02	0	0
ODP	kg CFC11 eq	5.83E-11	1.07E-13	6.99E-13	5.39E-12	0	0	4.26E-11	0	0
AP	mol H^+ eq	1.3E-02	3.26E-03	5.35E-03	1.39E-02	0	0	1.08E-01	0	0
EP-freshwater	kg P eq	2.35E-06	1.74E-06	1.14E-05	6.87E-06	0	0	2.27E-05	0	0
EP-marine	kg N eq	2.67E-03	1.59E-03	1.96E-03	6.47E-03	0	0	2.83E-02	0	0
EP-terrestrial	mol N eq	2.92E-02	1.72E-02	2.06E-02	7.01E-02	0	0	3.08E-01	0	0
POCP	kg NMVOC eq	7.27E-03	4.3E-03	4.61E-03	1.72E-02	0	0	8.46E-02	0	0
ADPE	kg Sb eq	2.02E-07	4.3E-08	2.8E-07	2.79E-06	0	0	9.46E-07	0	0
ADPF	MJ	1.05E+02	8.28E+00	5.4E+01	5.07E+01	0	0	2.01E+02	0	0
WDP	m^3 world eq deprived	4.24E-01	2.96E-03	1.93E-02	4.88E-01	0	0	1.65E+00	0	0

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 ton Iron Silicate

Parameter	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	1.67E+01	6.24E-01	4.07E+00	4.97E+00	0	0	3.87E+01	0	0
PERM	MJ	0	0	0	0	0	0	0	0	0
PERT	MJ	1.67E+01	6.24E-01	4.07E+00	4.97E+00	0	0	3.87E+01	0	0
PENRE	MJ	1.05E+02	8.28E+00	5.4E+01	5.07E+01	0	0	2.01E+02	0	0
PENRM	MJ	0	0	0	0	0	0	0	0	0
PENRT	MJ	1.05E+02	8.28E+00	5.4E+01	5.07E+01	0	0	2.01E+02	0	0
SM	kg	0	0	0	0	0	0	0	9.7E+02	0
RSF	MJ	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0
FW	m^3	1.72E-02	3.09E-04	2.01E-03	1.33E-02	0	0	4.84E-02	0	0

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 ton Iron Silicate

Parameter	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	9.09E-09	3.32E-10	2.17E-09	6.99E-09	0	0	4.39E-08	0	0
NHWD	kg	5.88E-02	1.16E-03	7.54E-03	1.28E-02	0	0	1E+03	0	0
RWD	kg	1.99E-02	1.56E-05	1.02E-04	6.43E-04	0	0	2.13E-03	0	0
CRU	kg	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	1E+03	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 ton Iron Silicate

Parameter	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	1.12E-07	3.84E-08	5.18E-08	2.66E-07	0	0	1.35E-06	0	0
IR	kBq U235 eq	1.29E+00	2.24E-03	1.46E-02	1.02E-01	0	0	2.36E-01	0	0
ETP-fw	CTUe	8.65E+00	1.08E+01	7.02E+01	5.06E+01	0	0	1.55E+02	0	0
HTP-c	CTUh	3.44E-10	1.45E-10	9.47E-10	8.07E-10	0	0	2.67E-09	0	0
HTP-nc	CTUh	1.57E-08	8.13E-09	5.29E-08	3.35E-08	0	0	9.98E-08	0	0
SQP	SQP	2.55E+01	3.66E+00	2.39E+01	1.43E+01	0	0	4.95E+01	0	0

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Standards

EN 12620
EN 12620:2008-07, Aggregates for concrete.

EN 13043
EN 13043:2002-12, Aggregates for bituminous mixtures and surface treatments for roads, airfields, and other trafficked areas.

EN 13139:2004
EN 13139:2004, Aggregates for mortar.

EN 13242
EN 13242:2008-03, Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.

EN 15804
EN 15804:2012 + A2:2019 + AC:2021, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

Regulation (EU) No 305/2011 (CPR)
Regulation (EU) No 305/2011 (Construction Products Regulation, CPR) – Laying down harmonised conditions for the marketing of construction products, European Commission, 2011.

Additional References

BBSR tables - Service Life of building components
BBSR tables - Service Life of building components: Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB, Bundesinstitut für Bau-, Stadt- und Raumforschung, Referat II Nachhaltiges Bauen; available online at: https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/, 2025.

ECHA Candidate List
ECHA List of Substances of Very High Concern (SVHC) for Authorisation, European Chemicals Agency (ECHA), 2024.

PCR – Part A
PCR Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN15804+A2:2019, version 1.4, Institut Bauen und Umwelt e.V., https://ibu-epd.com/, 2024.

PCR – Part B
PCR – Part B: Requirements of the EPD for Lightweight aggregates / Bulk granulate, version v8, 04/07/2023 (template v11, 01/08/2024), Institut Bauen und Umwelt e.V., https://ibu-epd.com/, 2024.

Sphera
Sphera's Software System LCA for Experts (LCA FE) and MLC databases (formerly GaBi), University of Stuttgart (LBP) and Sphera, Leinfelden-Echterdingen; dataset documentation available online at: https://lcadatabase.sphera.com/.

Publisher

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

Sphera Solutions GmbH
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

+49 (0)711 341817-0
info@sphera.com
www.sphera.com

Owner of the Declaration

Aurubis Bulgaria AD
Industrial zone 1
2070 Pirdop
Bulgaria

+35972862260
info@aurubis.com
www.aurubis.com